Early Results from the Jason-1/Jason-2 Tandem Mission

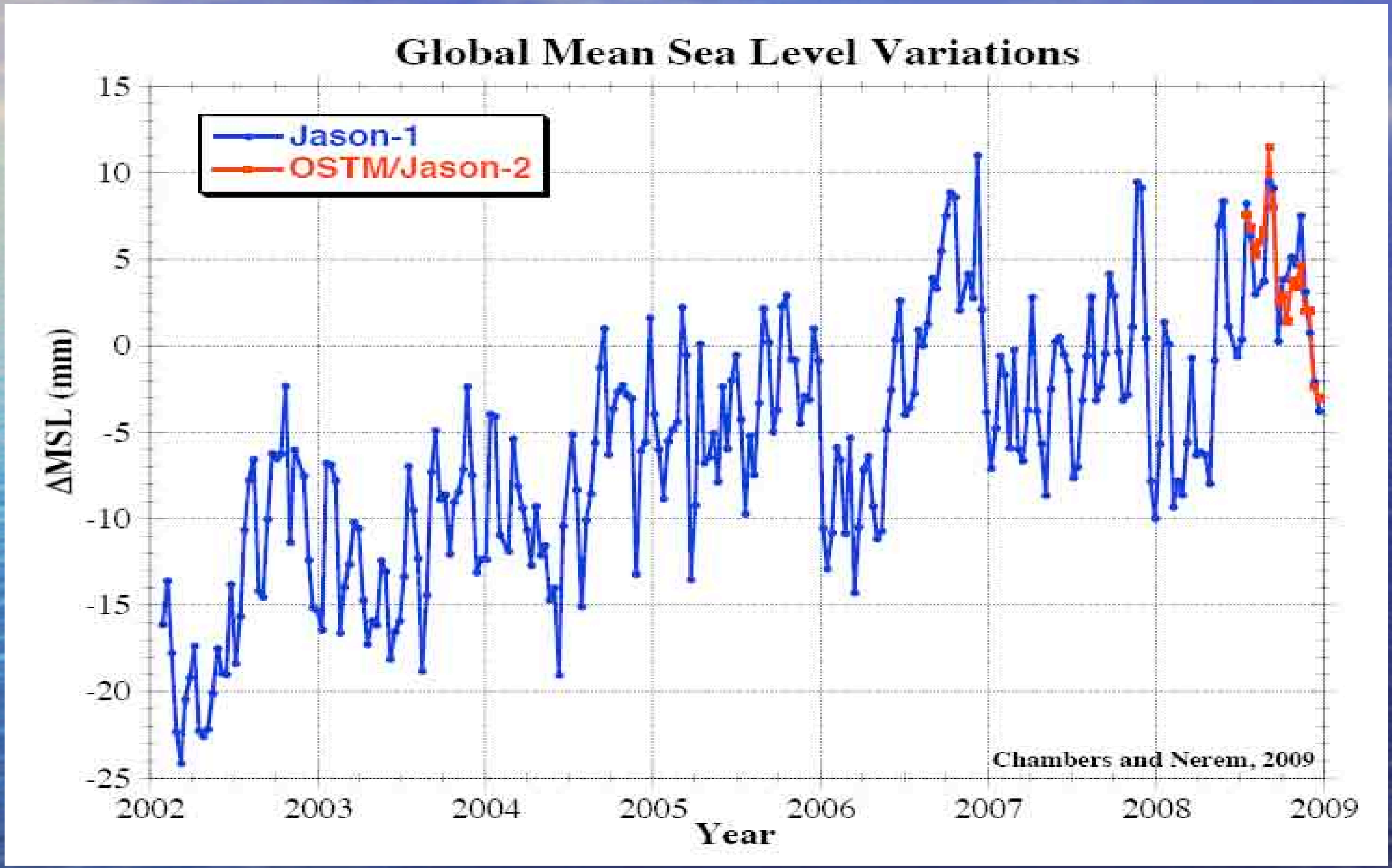
Josh K. Willis

Jet Propulsion Laboratory
California Institute of Technology

OSTM/Jason-2

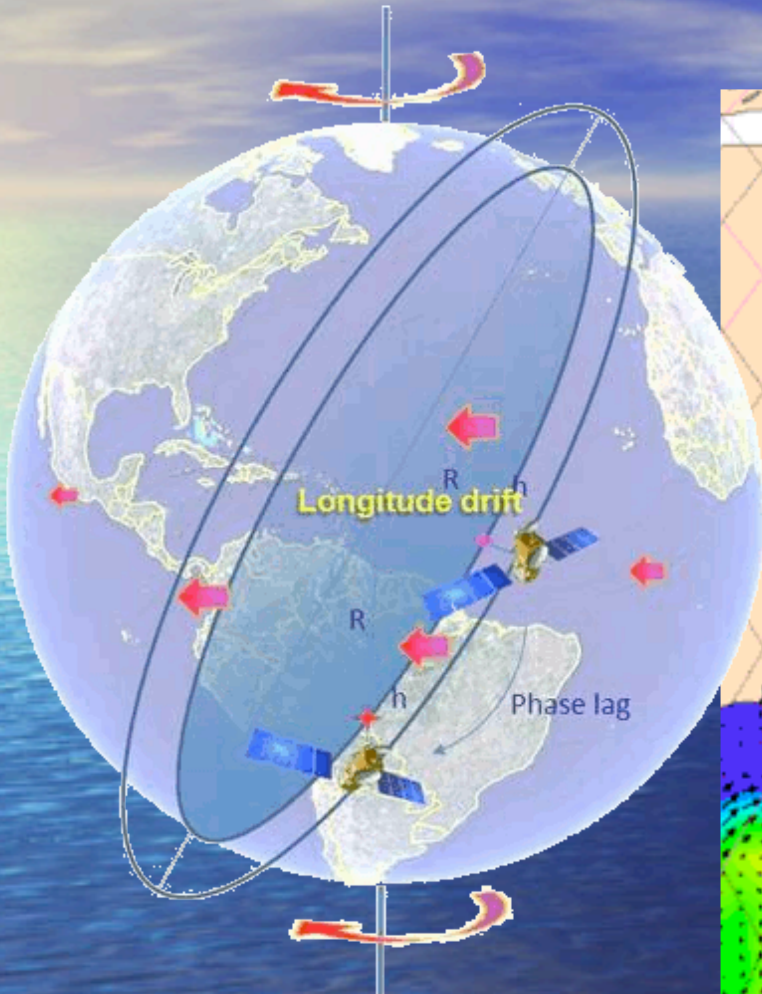
June 20, 2008

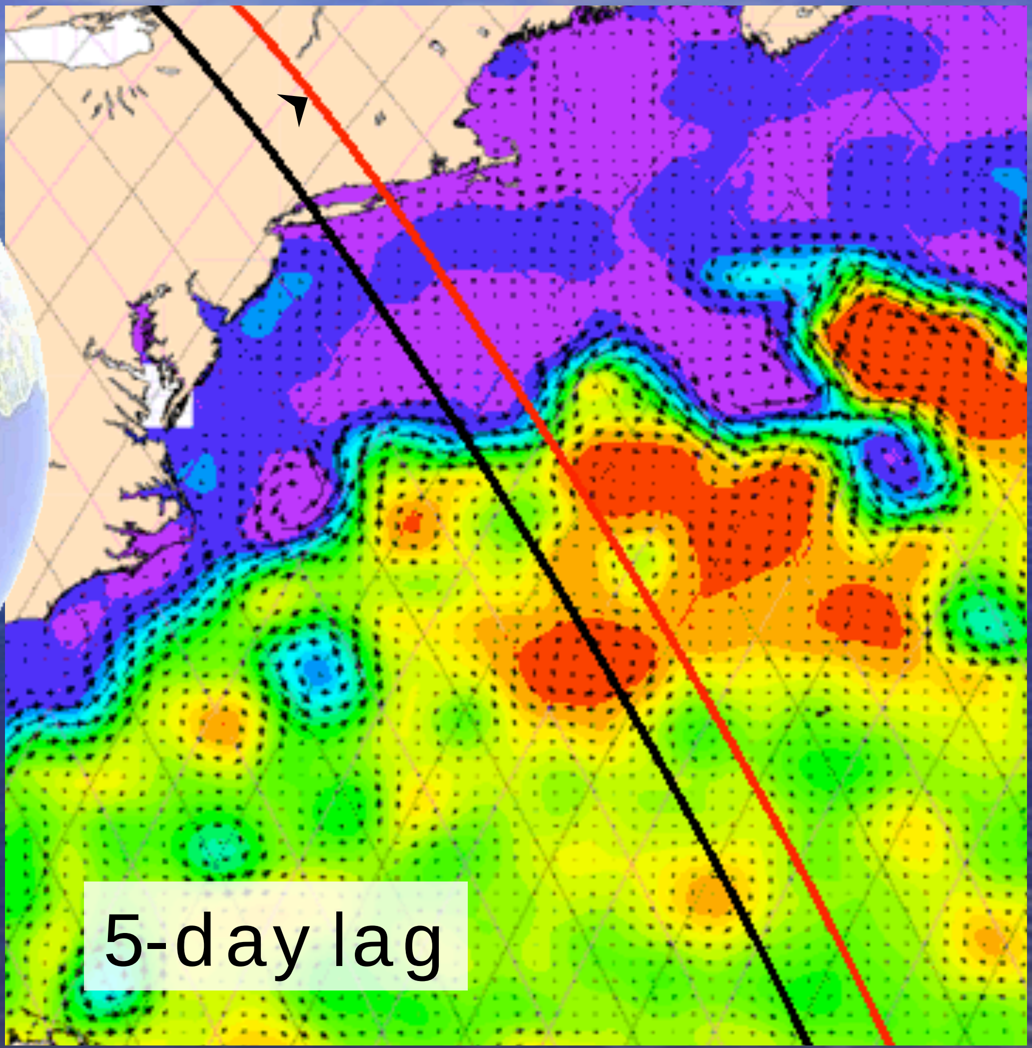
The first six months – Cal/Val



Seamless transition of the global mean sea level record from Jason-1 to Jason-2

The Interleaved Mission





Jan-Feb, 2009

The need for High-Resolution Altimetry

Early Interleaved Mission Results

The Gulf Stream in Early March, 2009

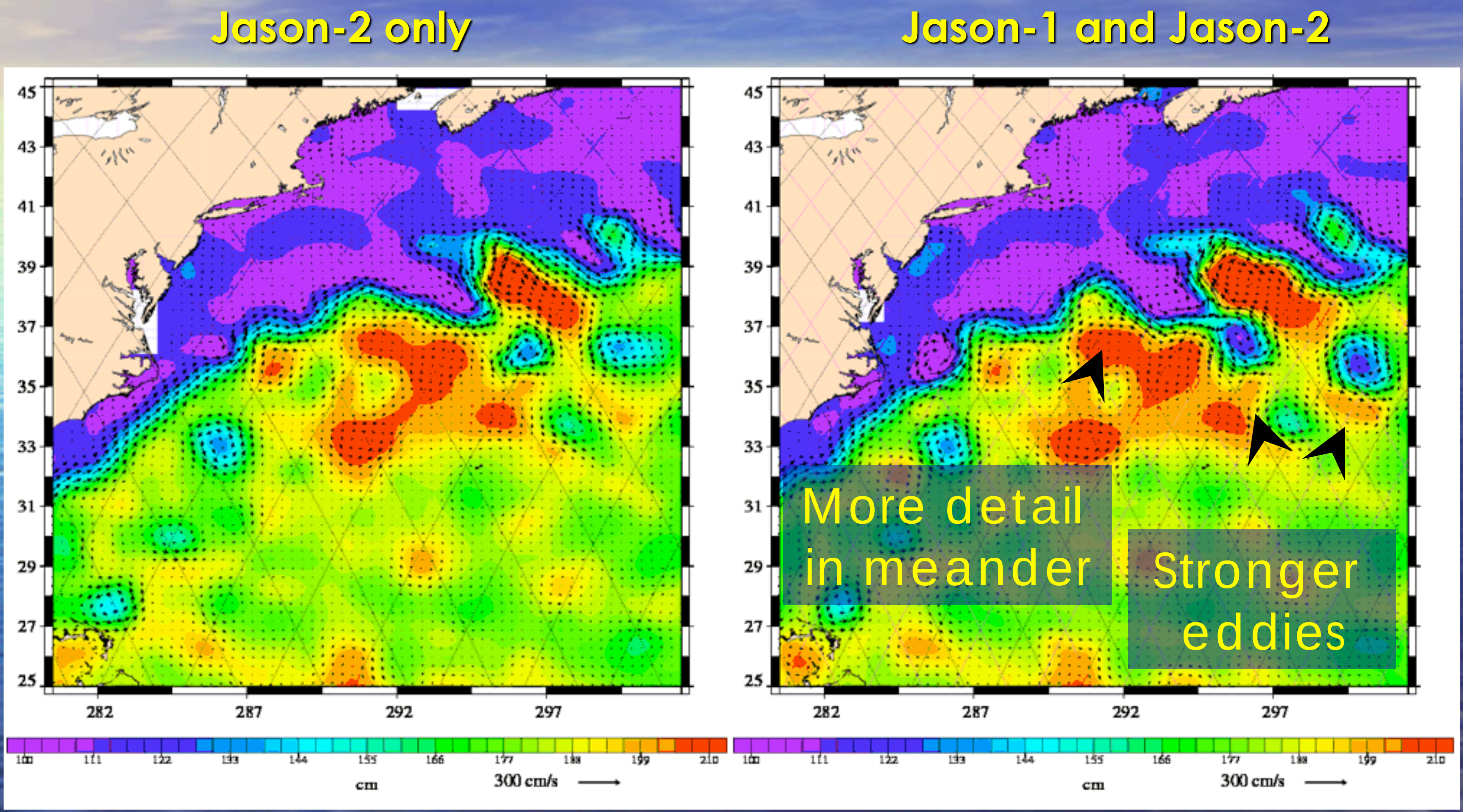
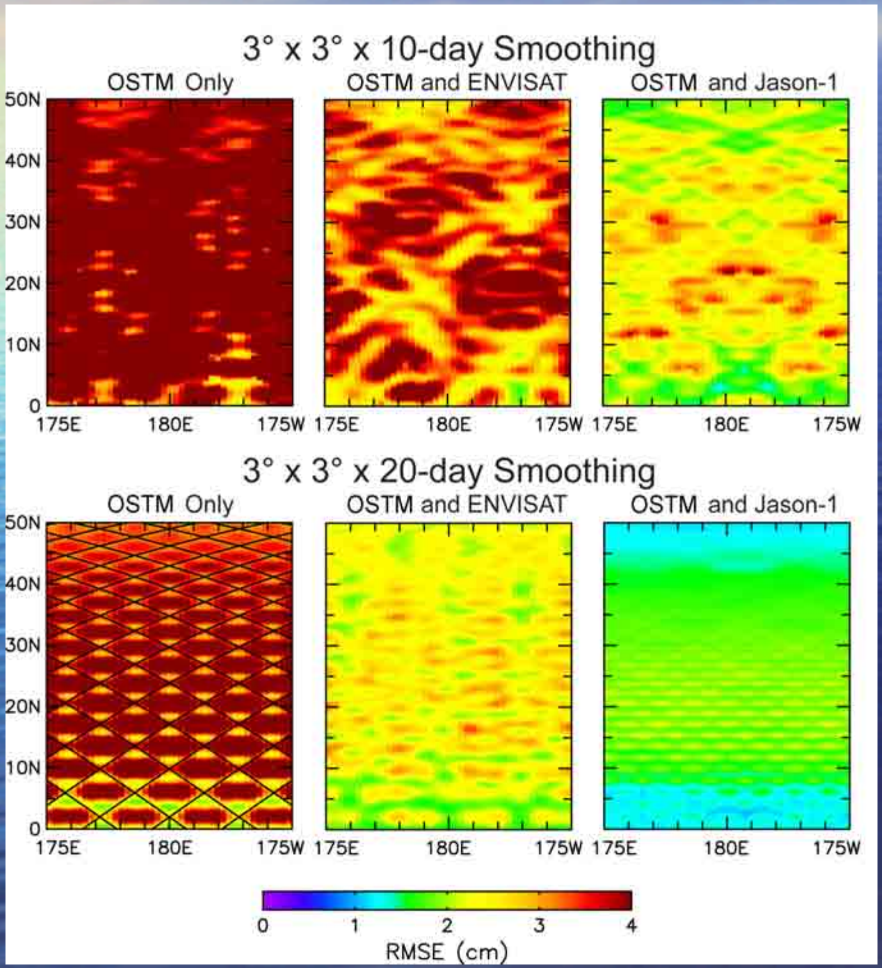


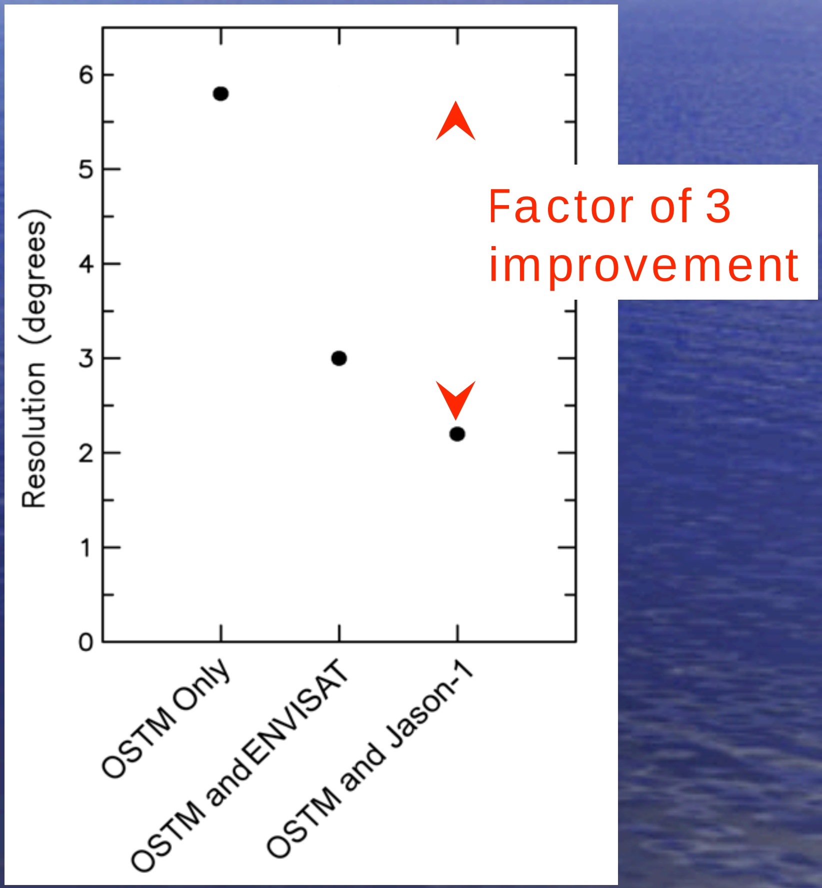
Image credit: CNES/CLS

Resolving the Mesoscale

Error in Smoothed SSH estimates



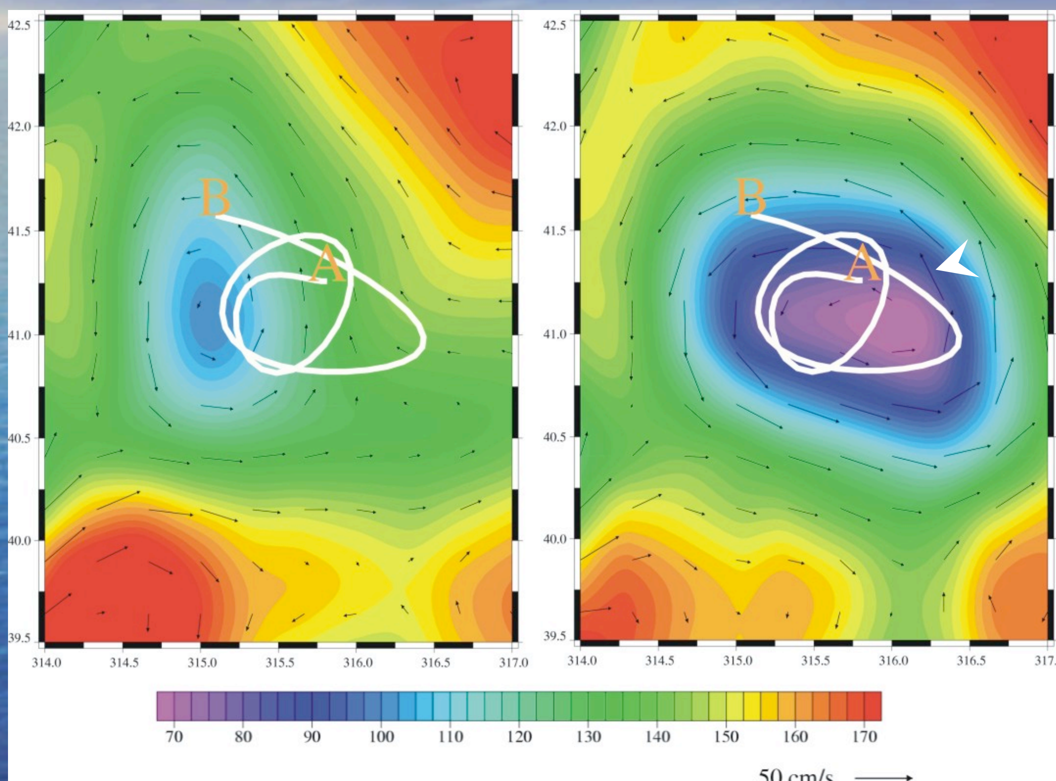
Effective Resolution of SSH estimates



Adapted from Chelton and Schlax (2003)

4 Satellites Capture Large Eddy

Comparison of altimetry and surface drifter data in a Gulf Stream cyclonic eddy



Surface Drifter

14 to 28, May 2003

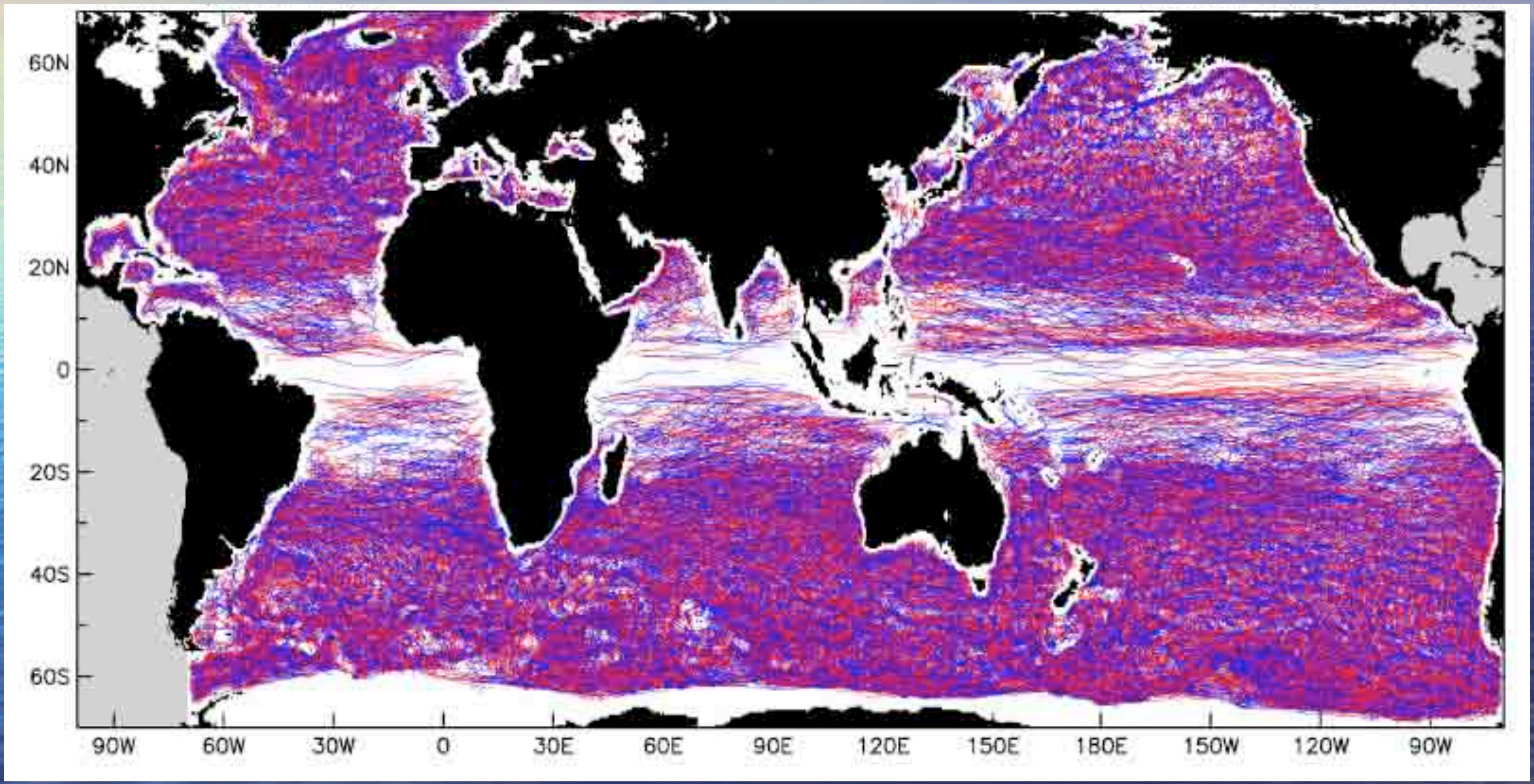
2-satellite (TP/ Envisat)

4-satellite (TP/Jason/ Envisat/GFO)

from Pascual et al. (2006)

The Mesoscale Eddy Field

Eddies with Lifetimes greater than 16 weeks

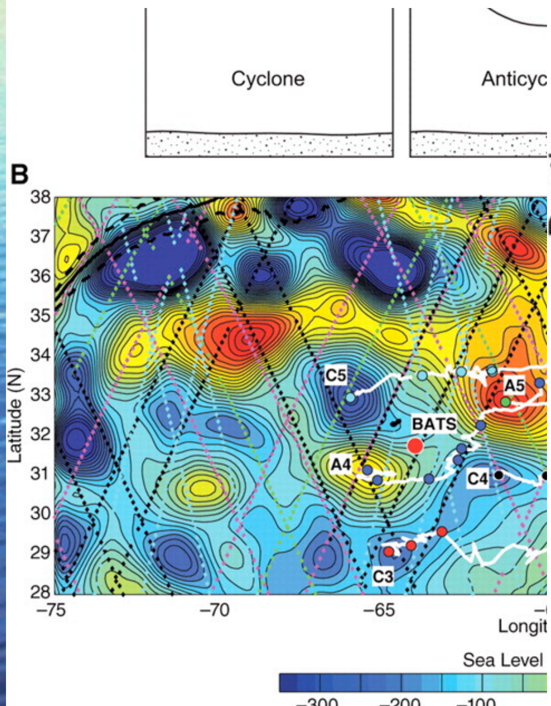


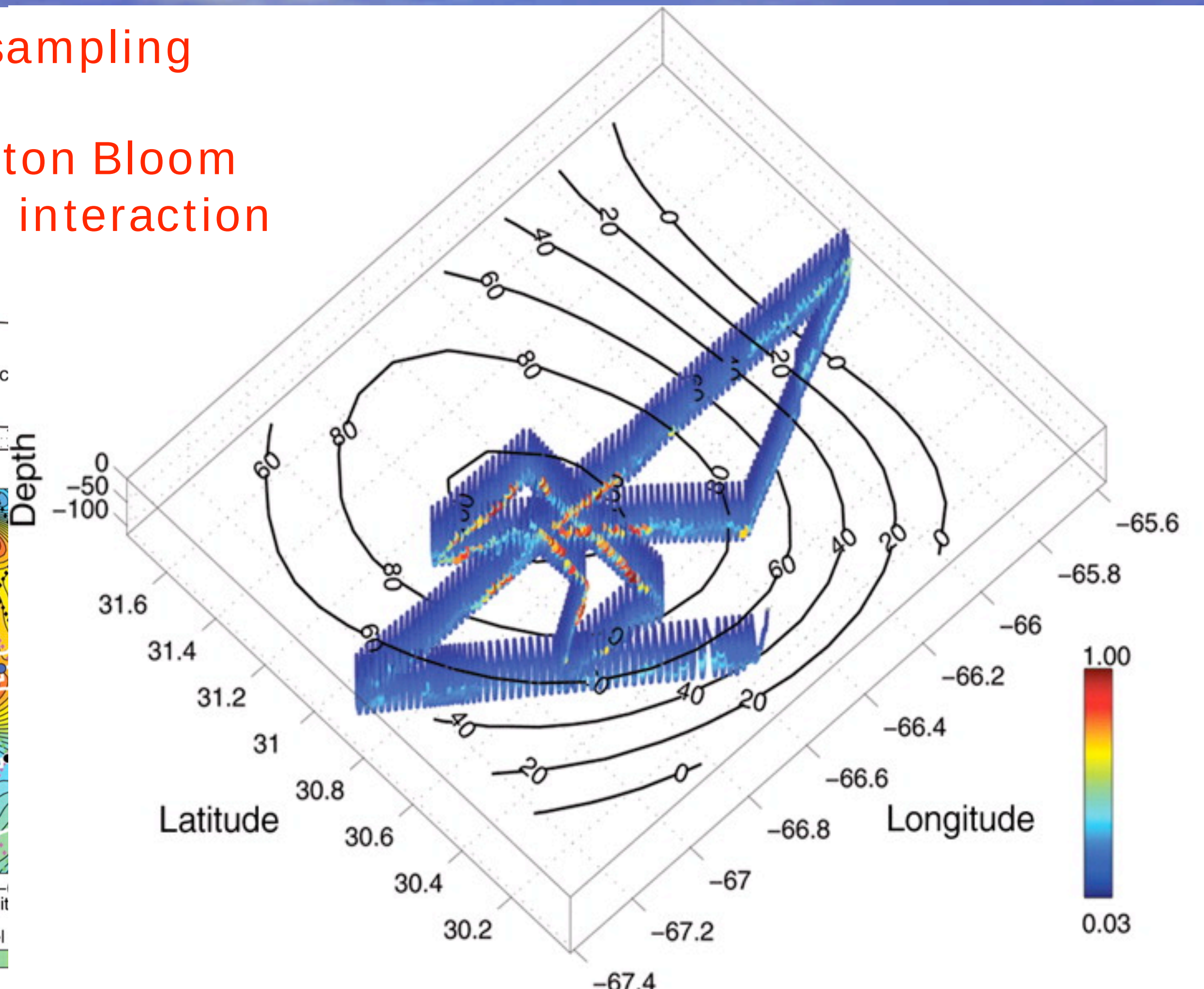
from Chelton et al. (2007)

Eddies and Phytoplankton

Repeated in-situ sampling

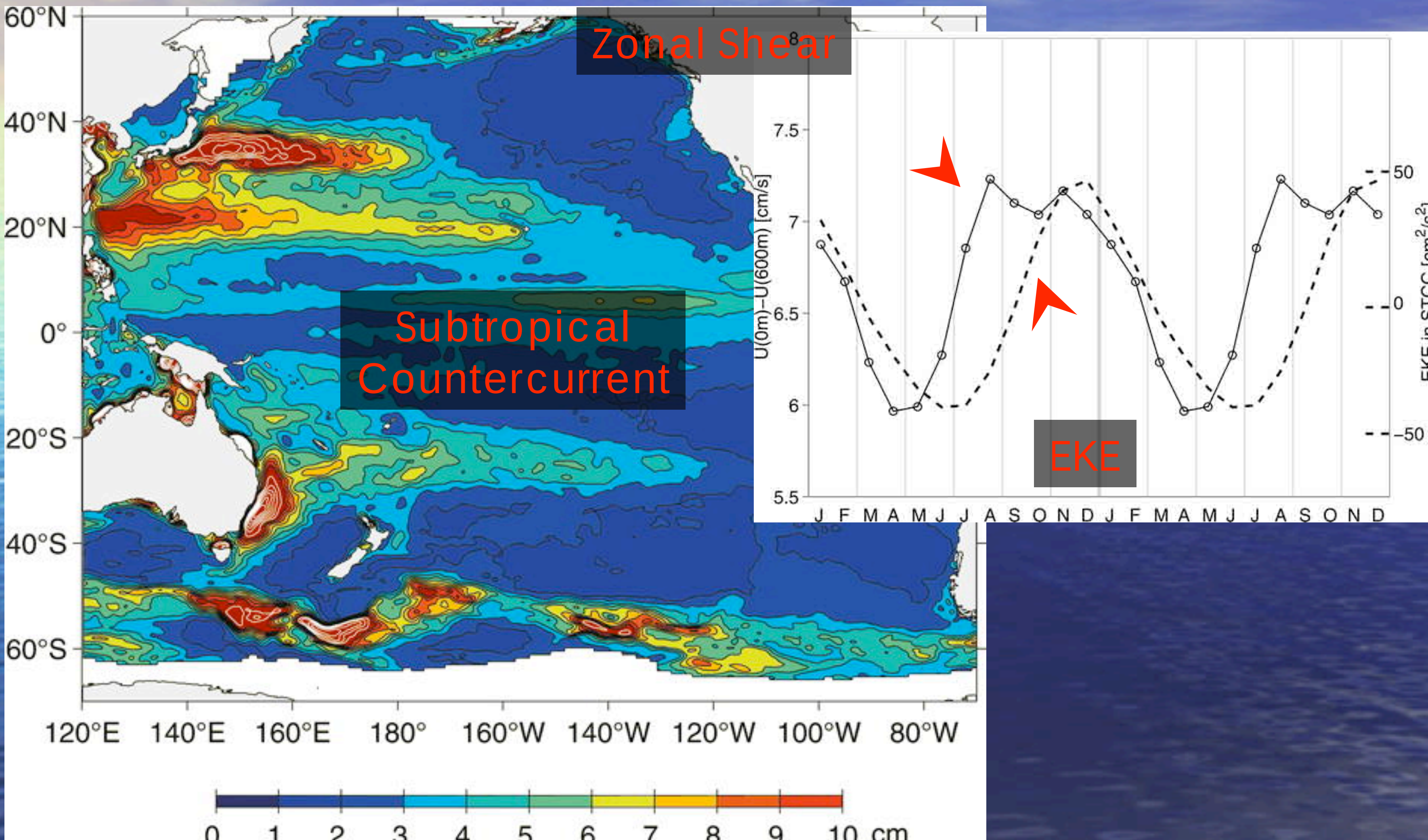
Massive Phytoplankton Bloom
Caused by eddy-wind interaction





from McGillicuddy et al. (2007)

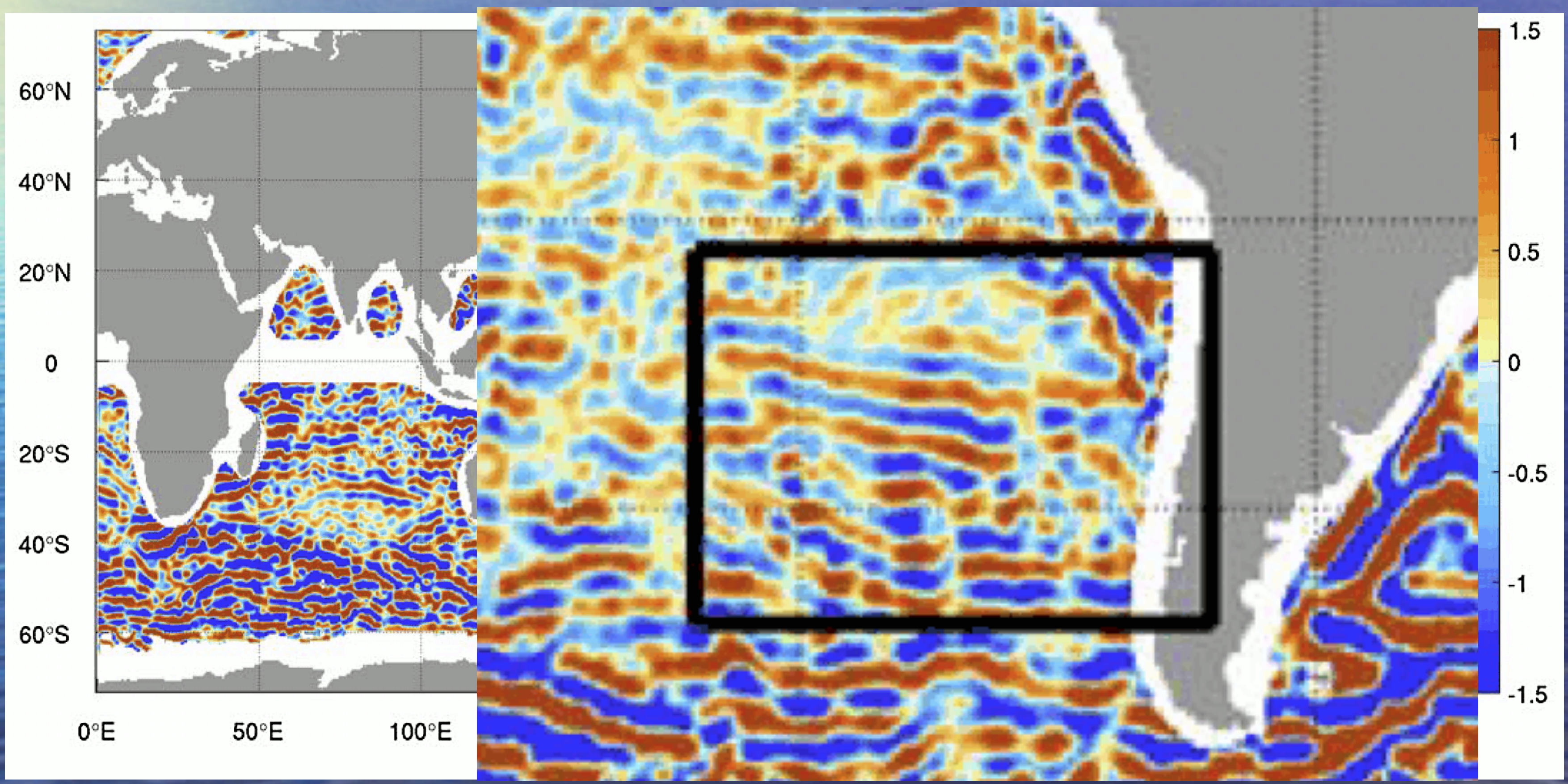
Eddy-Mean Flow Interactions



from Qiu et al. (2008)

Mesoscale features of the Mean Flow

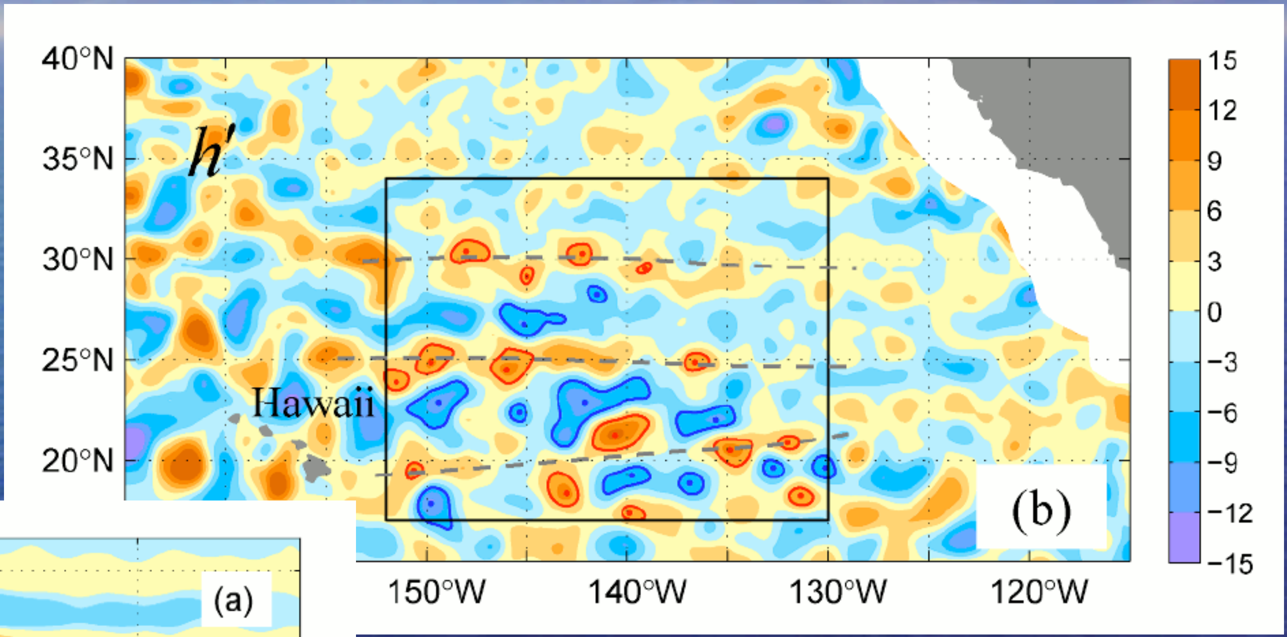
Zonal Geostrophic Velocity from 10-year mean SSH

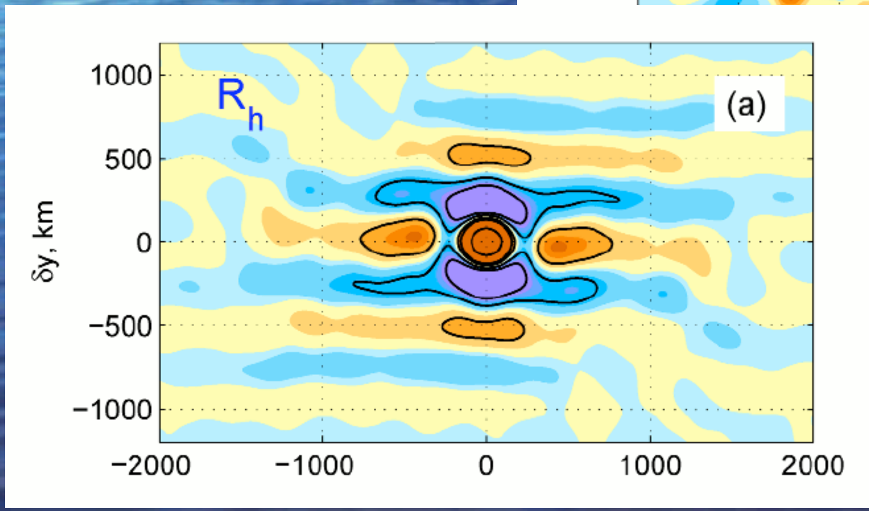


from Maximenko et al. (2008)

Mesoscale features of the Mean Flow

Snapshot SSH from AVISO, August 2001



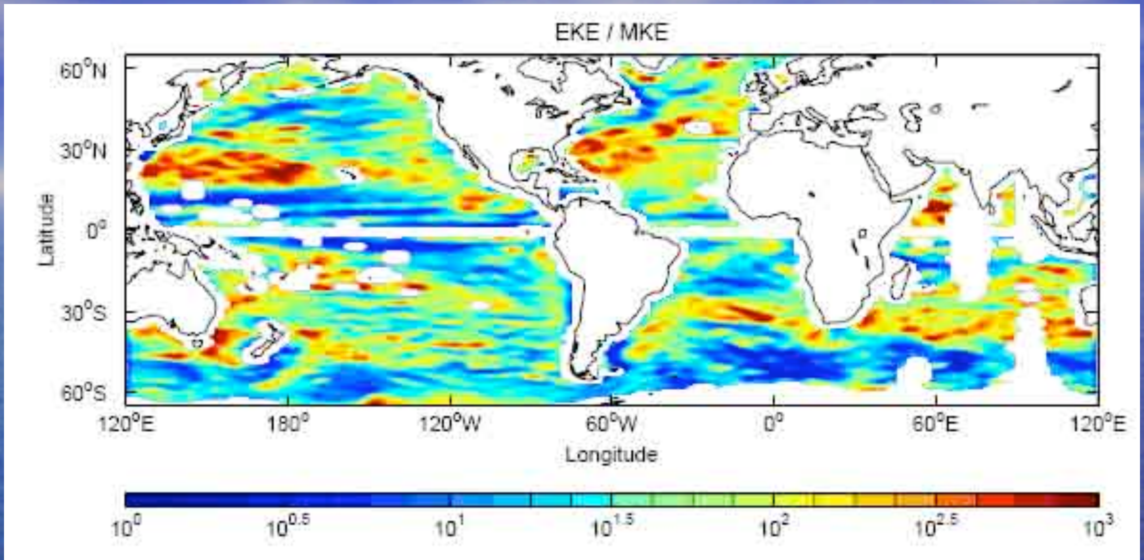


Spatial Correlation

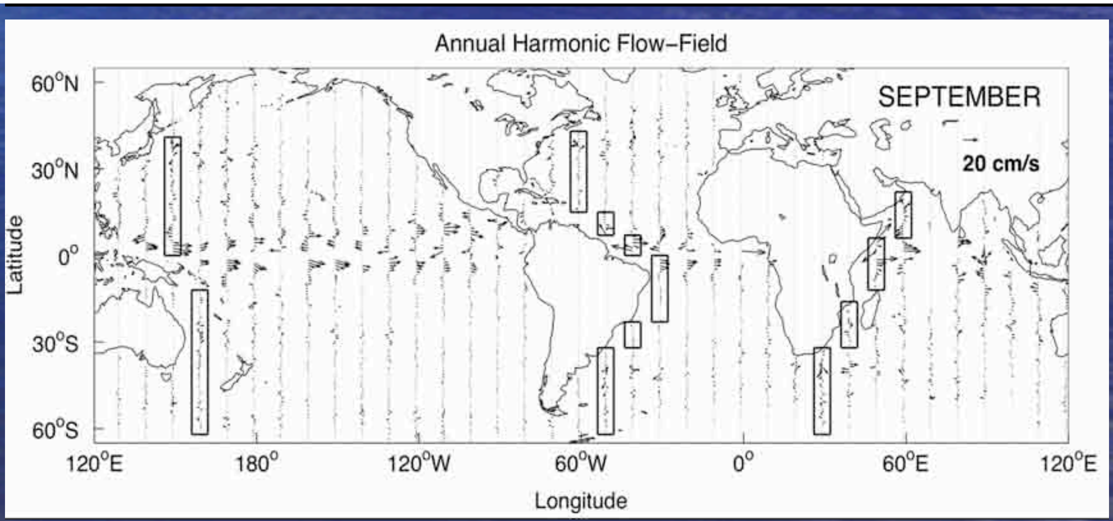
from N. Maximenko

The Jason-1 T/P Interleaved Mission

Large-scale eddy variability



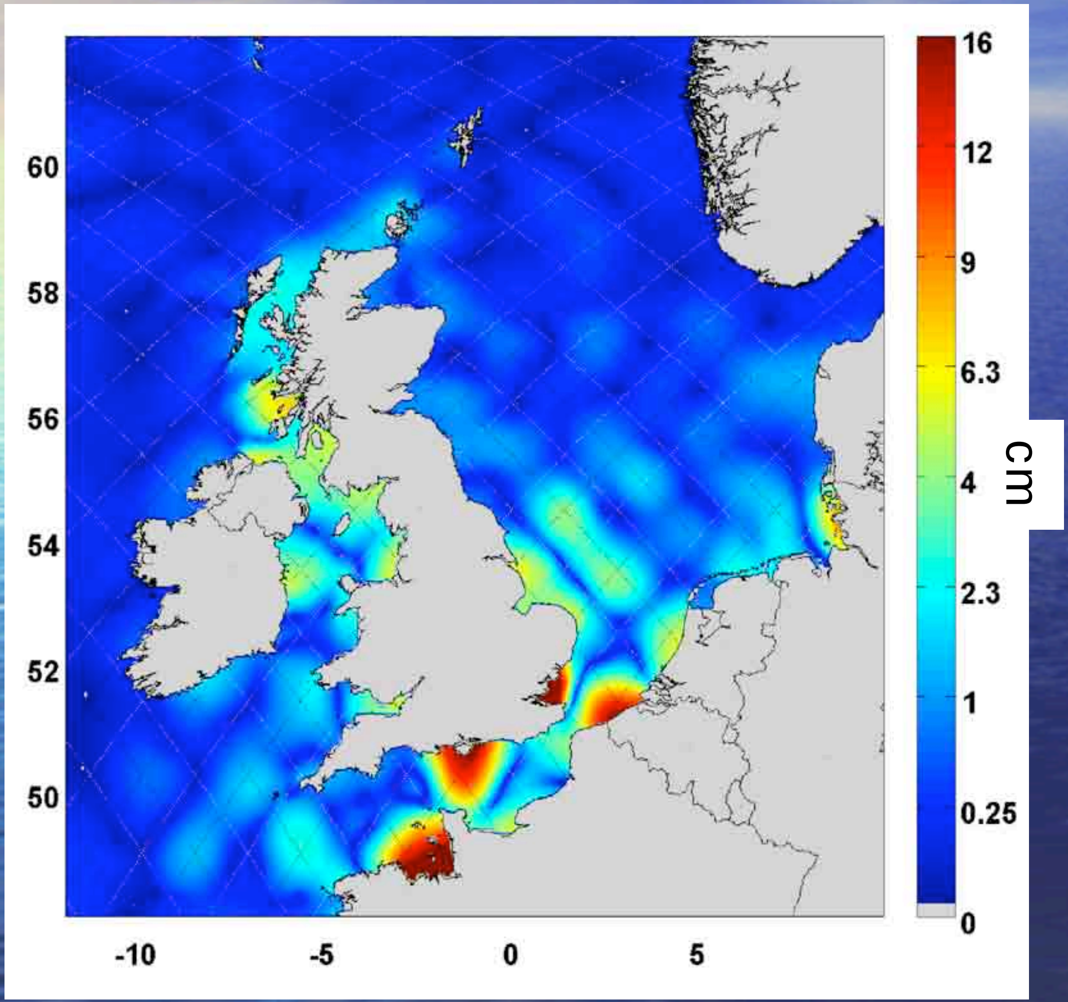
Seasonal flow changes



(See three posters)

Scharffenberg and Stammer, 2009

Shallow Water Tides



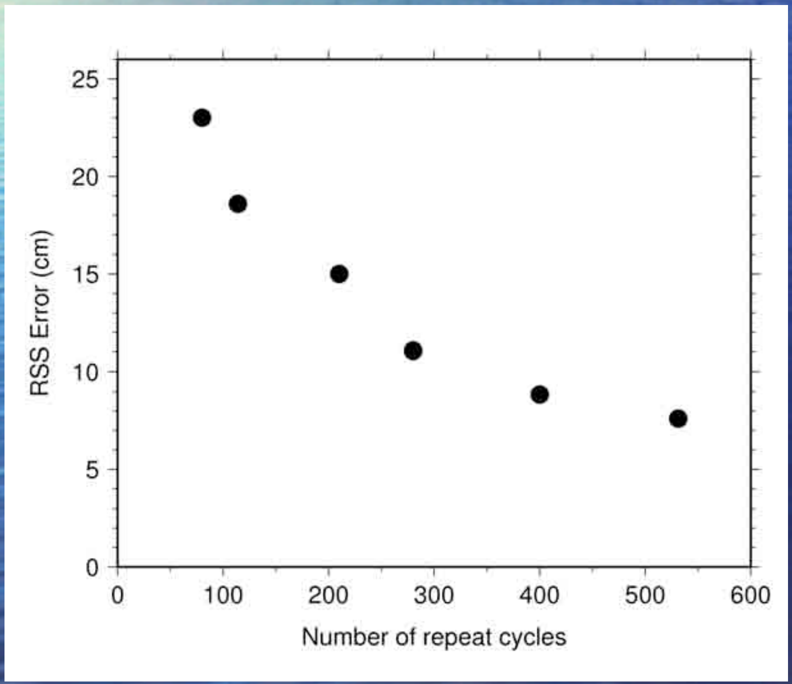
Differences in M2 tide solutions from T/P only and Jason-1 + T/P

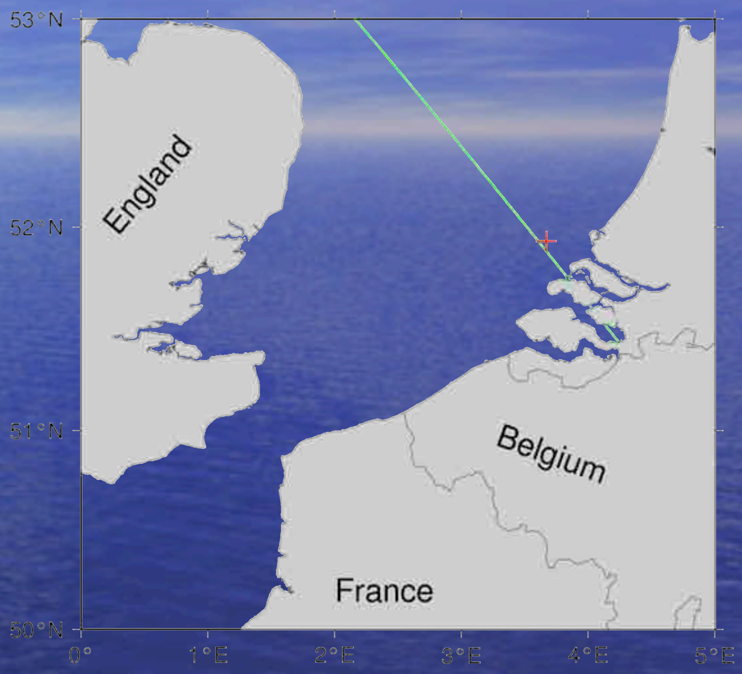
Differences in M2 tide solutions from T/P only and Jason-1 + T/P

from R. Ray

Shallow Water Tides

Comparison with Dutch bottom pressure recorder





Complex, nonlinear tides require a very long time series to resolve!

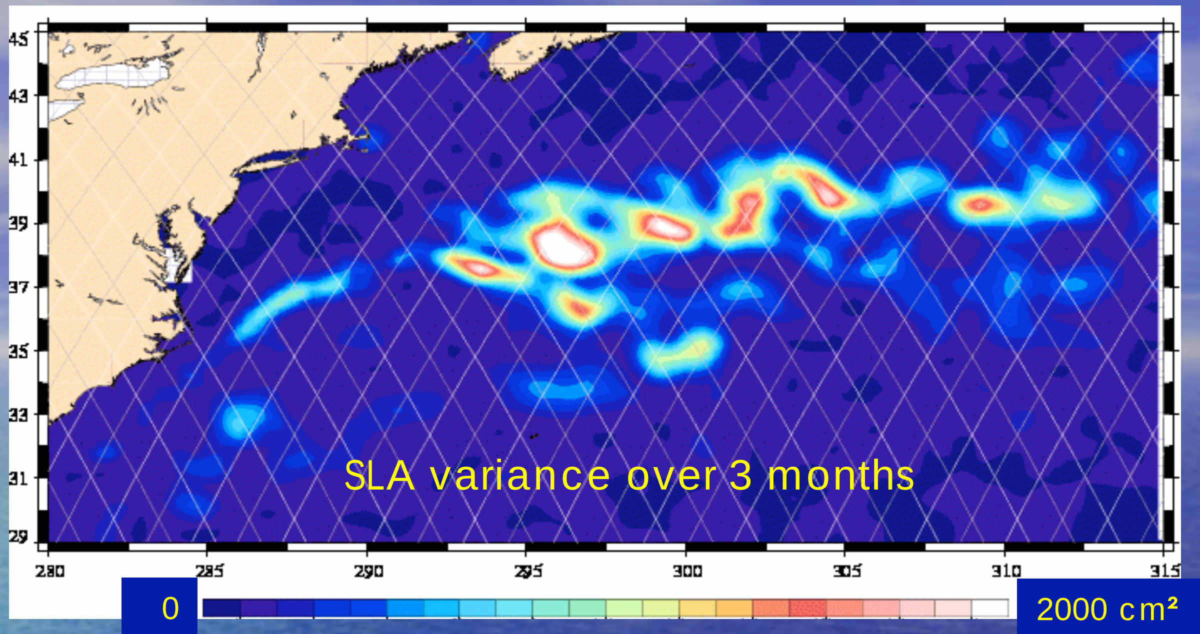
from R. Ray

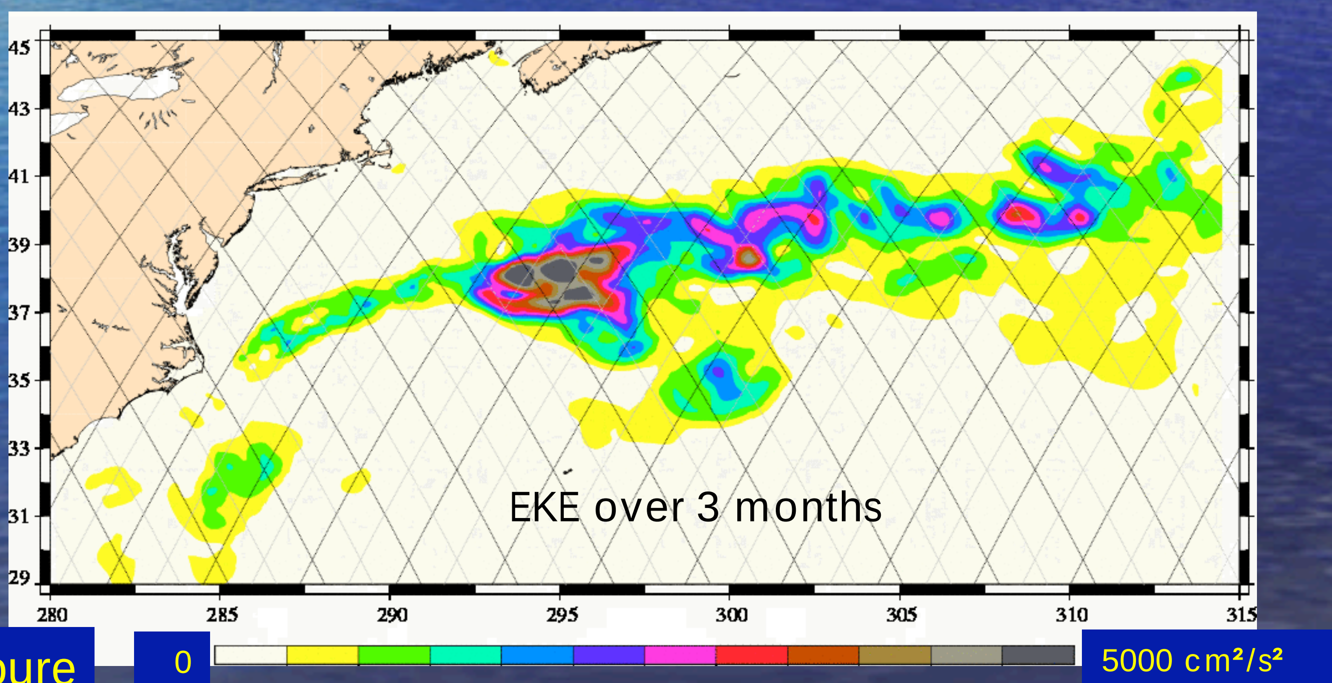
From G. Dibarboure

- Animation of Jason2 vs tandem EKE and variance of SLA maps
- More variability observed
- Geographical continuity and coherency from one satellite track to the next with tandem (vs blind spots between mono-satellite tracks)
- Features totally invisible with a single satellite can be observed with a tandem

from G. Dibarboure

Animation : Jason-2 alone
Jason-2 vs Tandem





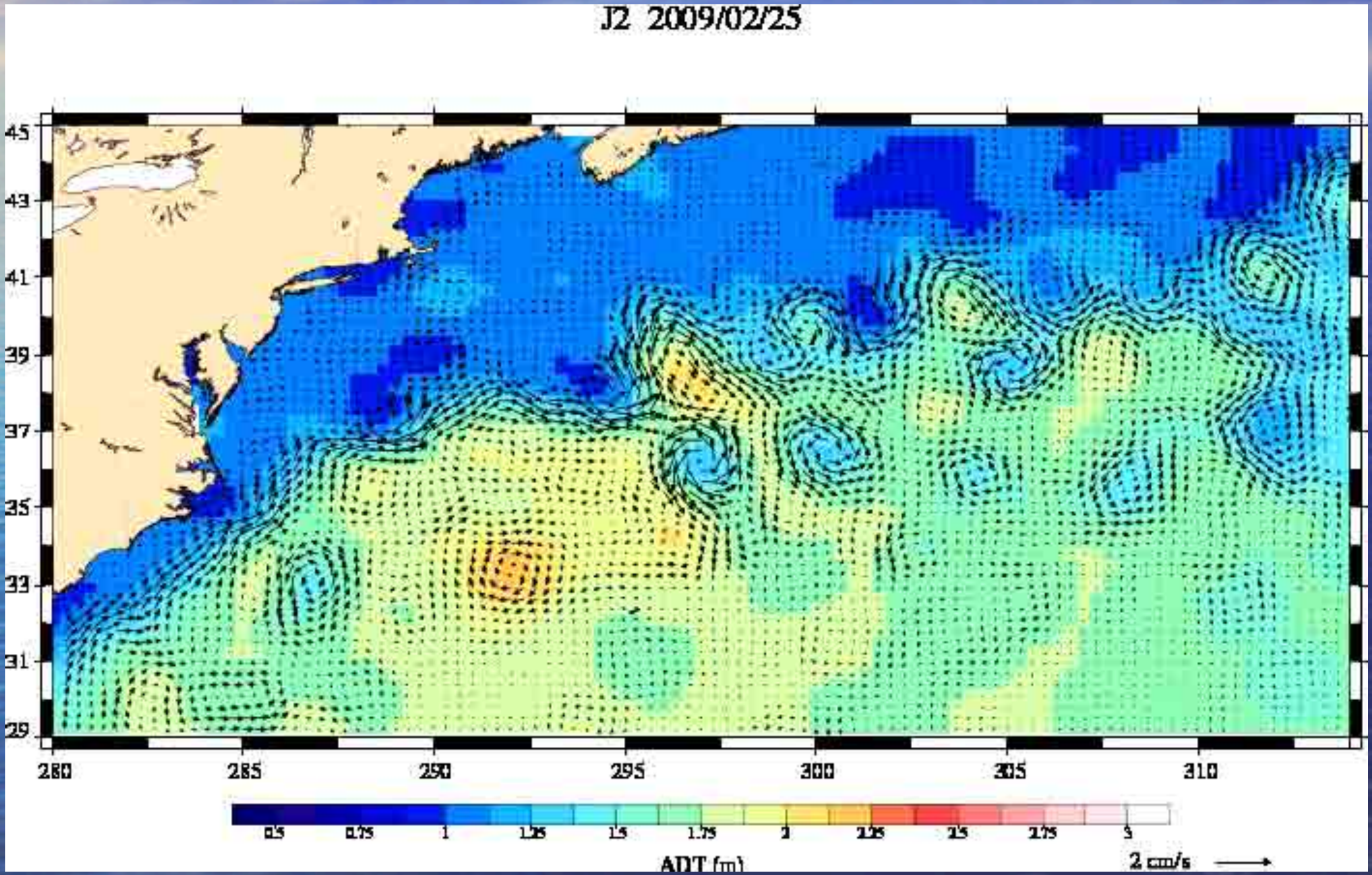
from G. Dibarboure

- Animation of daily absolute dynamic topography maps (Tandem followed by Jason2 alone)
- Based on actual operational data (NRT processing mode)

- Temporal coherency of observation possible only with the Jason tandem (still poor with 2 sats in NRT)
- Many features entirely lost in Jason2 crossover diamonds when Jason1 is not here

from G. Dibarboure

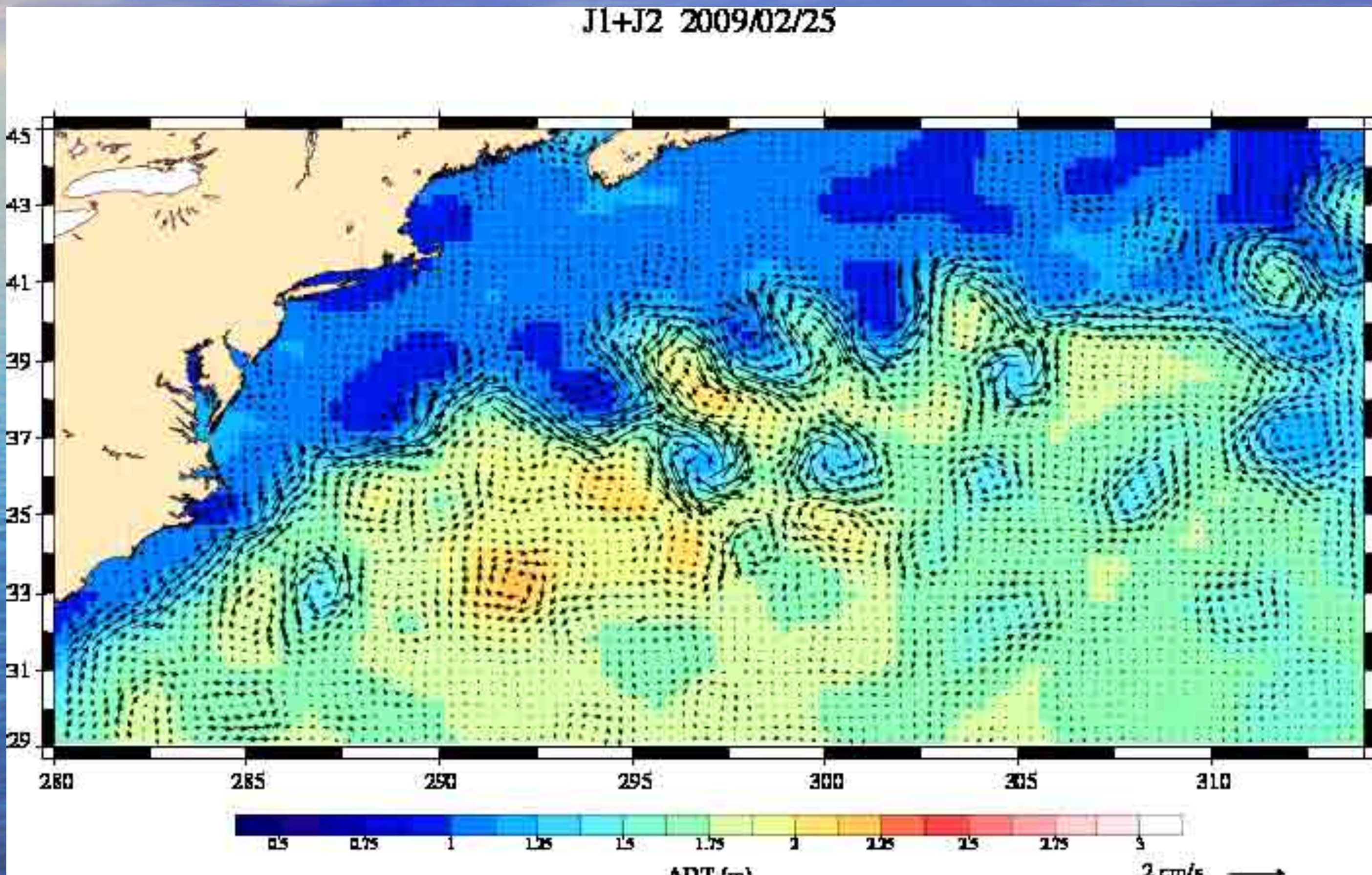
Jason-2 alone
Operational NRT mapping



Absolute Dynamic Topography (m)

from G. Dibarboure

Jason-1/2 Tandem
Operational NRT mapping



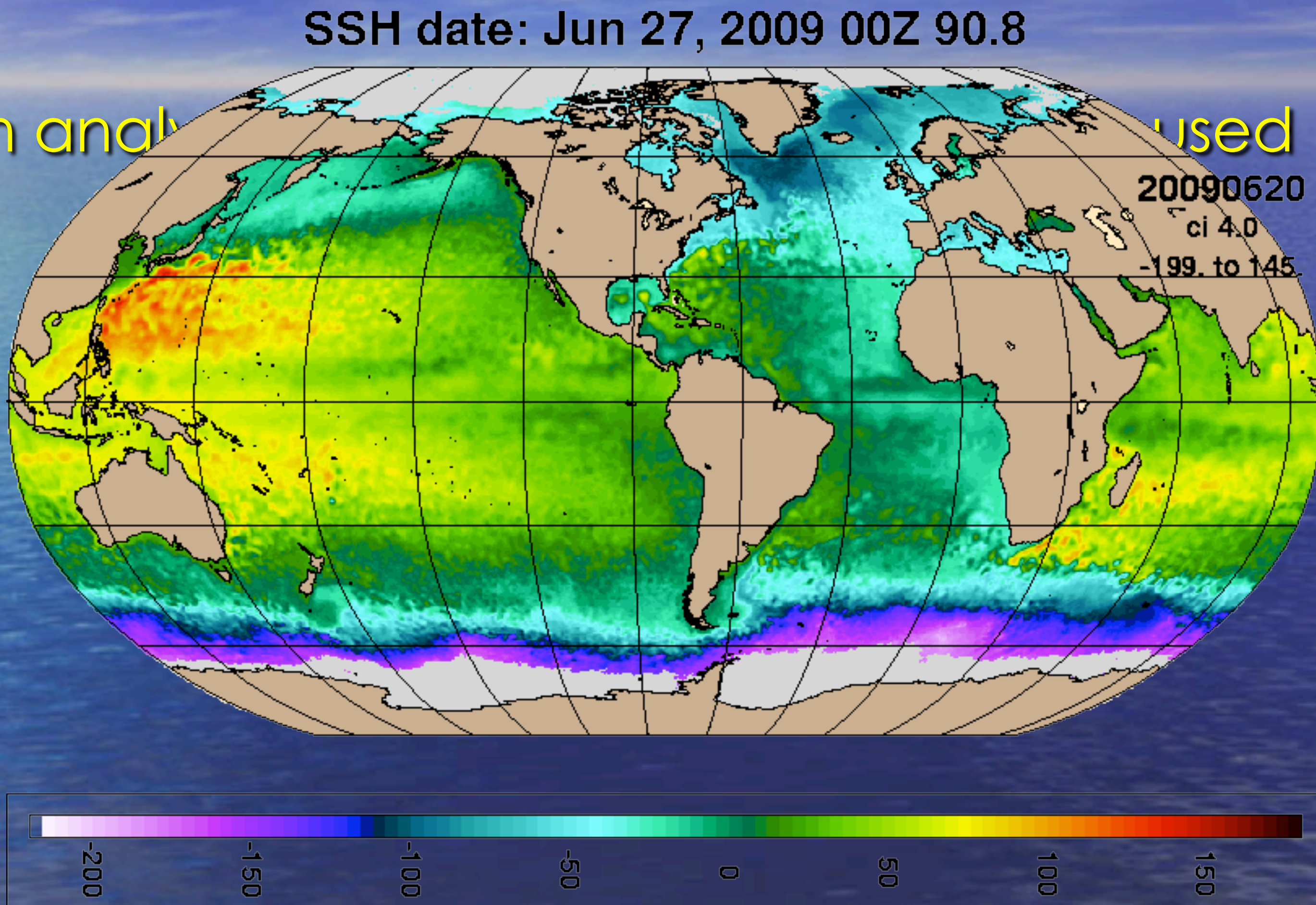
Absolute Dynamic Topography (m)

from G. Dibarboure

Jason-1/2 Data in 1/12° Global HYCOM-NCODA Nowcast-Forecast System

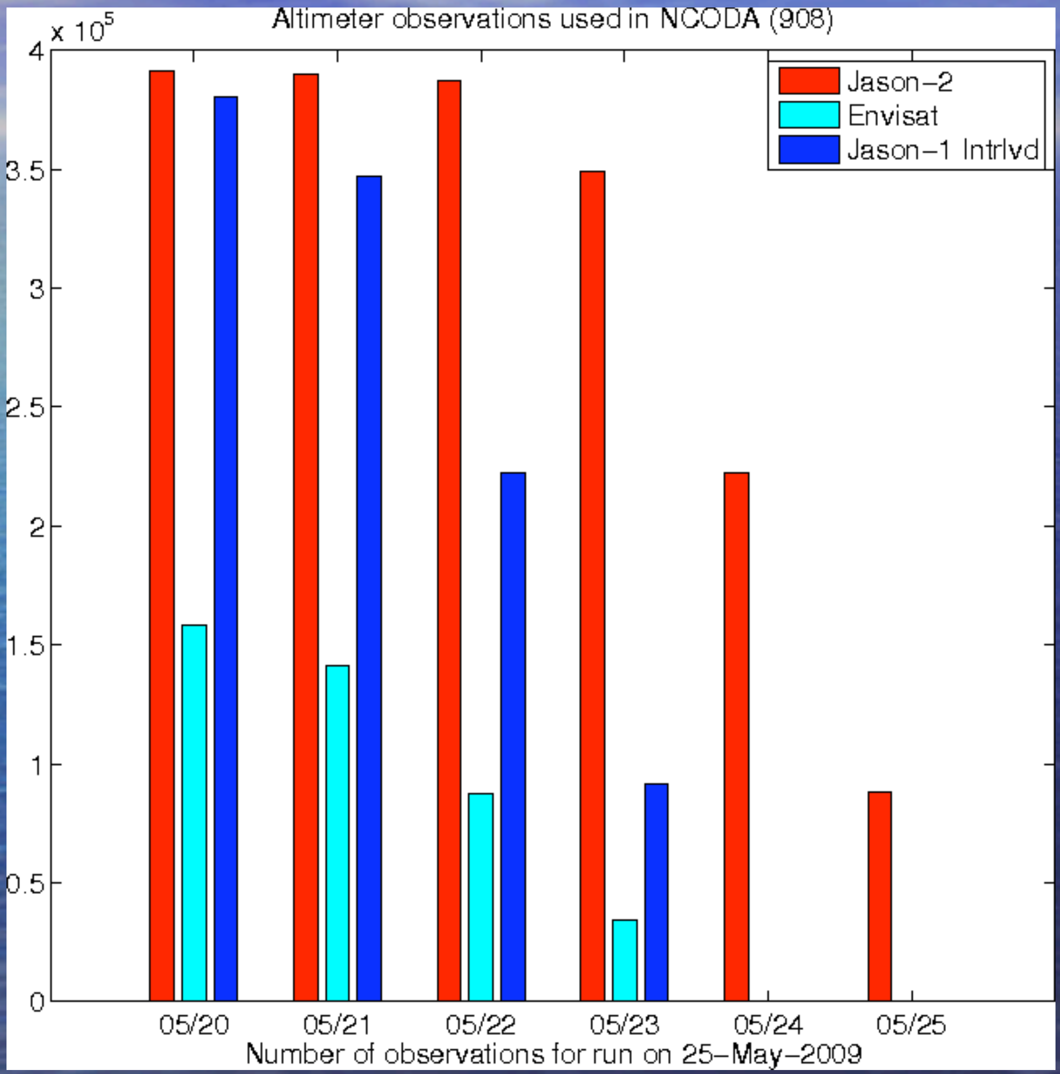
For a given anal

used



from J. Metzger

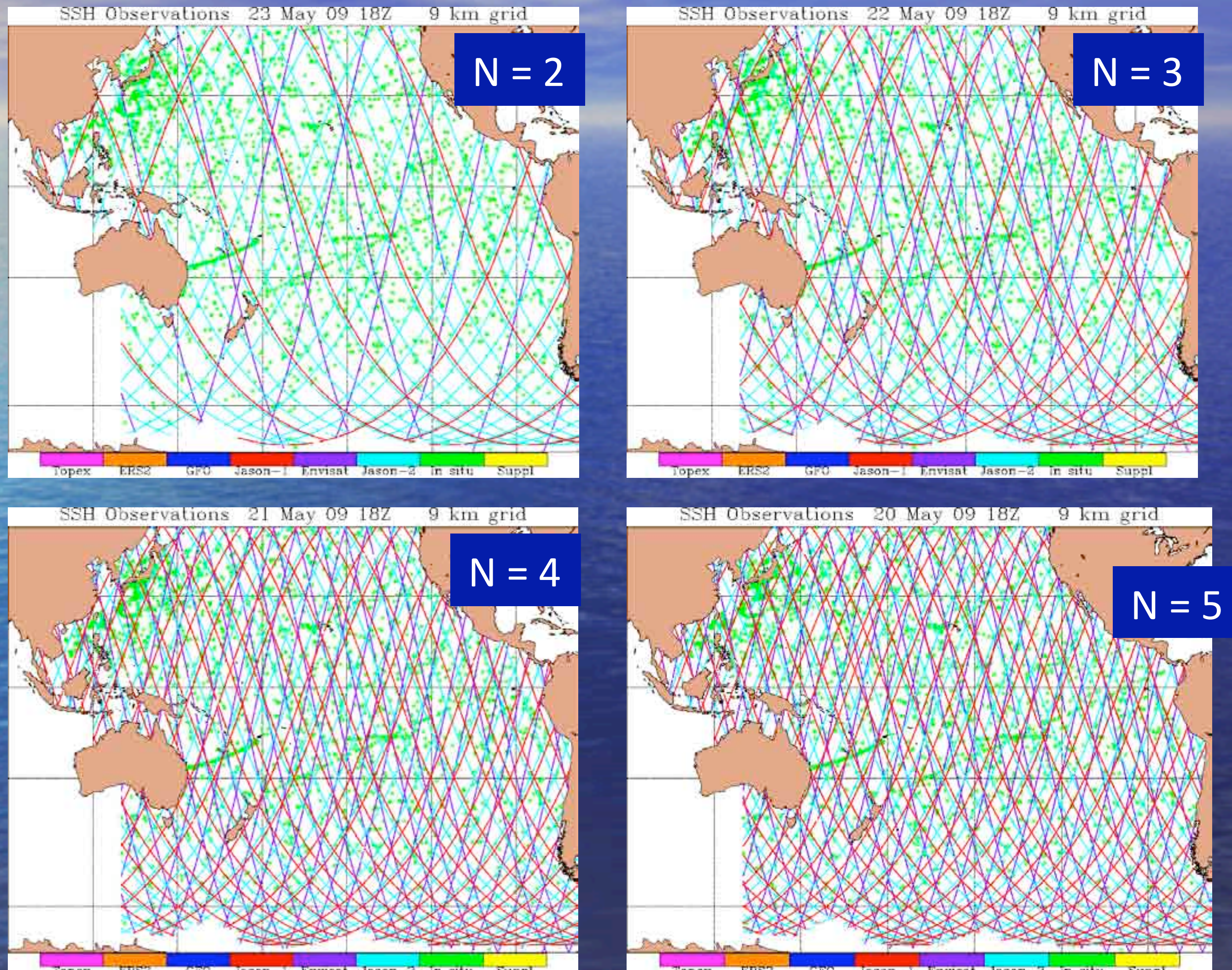
Latency of Altimeter Data in NCODA Ocean Analysis for 25 May 2009 18Z



from J. Metzger

SSH Observations Used in the NCODA Ocean Analysis N days prior to 25 May 2009 18Z

(Red = Jason-1 Interleaved, Cyan = Jason-2)



from J. Metzger

th after

-1/2

– 14 Mar

Global	**(0.0010)**
66ºS-66ºN	**(0.0003)**
66ºS-23.5ºS	**(0.0026)**
23.5ºS-23.5ºN	**(-0.0064)**
23.5ºN-66ºN	**(0.0016)**

GODAE OceanView

19 June 2009

To:

Joshua Willis
Jet Propulsion Laboratory
M/S 300-323
4800 Oak Grove Drive
Pasadena, CA 91109
USA

Re: GODAE OceanView in support of the JASON-1 mission

Dear Josh,

Following on from the successful Global Ocean Data Assimilation Experiment (GODAE)

...

However, GODAE OceanView would like to take the opportunity of this upcoming OSTST meeting now to reinforce the need to continue the operation of the Jason 1 mission.

With best regards,

Andreas Schiller

Eric Dombrowsky

Co-Chairs GODAE OceanView Science Team

By courtesy of Daniel Lea, Met Office, UK

ECMWF Surface Wave Forecast

Impact of Jason-1 SWH assimilation
(From 10 February to 18 May 2009)

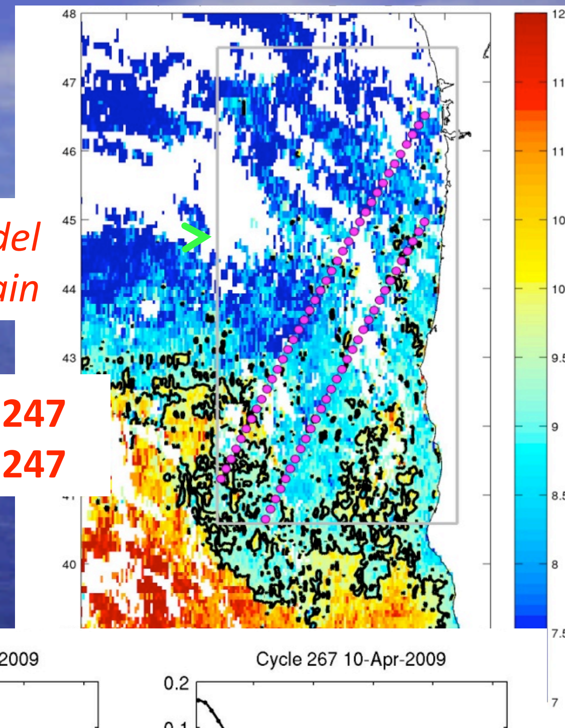
	SWH		Mean W. Period, T_z		Peak W. Period , T_p	
(# of collocations)	(38174)		(28986)		(23288)	
	Bias (cm)	SI (%)	Bias (s)	SI (%)	Bias (s)	SI (%)
Jason-1 + (Jason-2 + ENVISAT)	- 3.5	14.7	- 0.168	10.8	0.080	15.6
Jason-2 + ENVISAT	- 3.7	15.1	- 0.172	10.9	0.082	15.7

from S. Abdalla

Modeling the Coastal Transition Zone

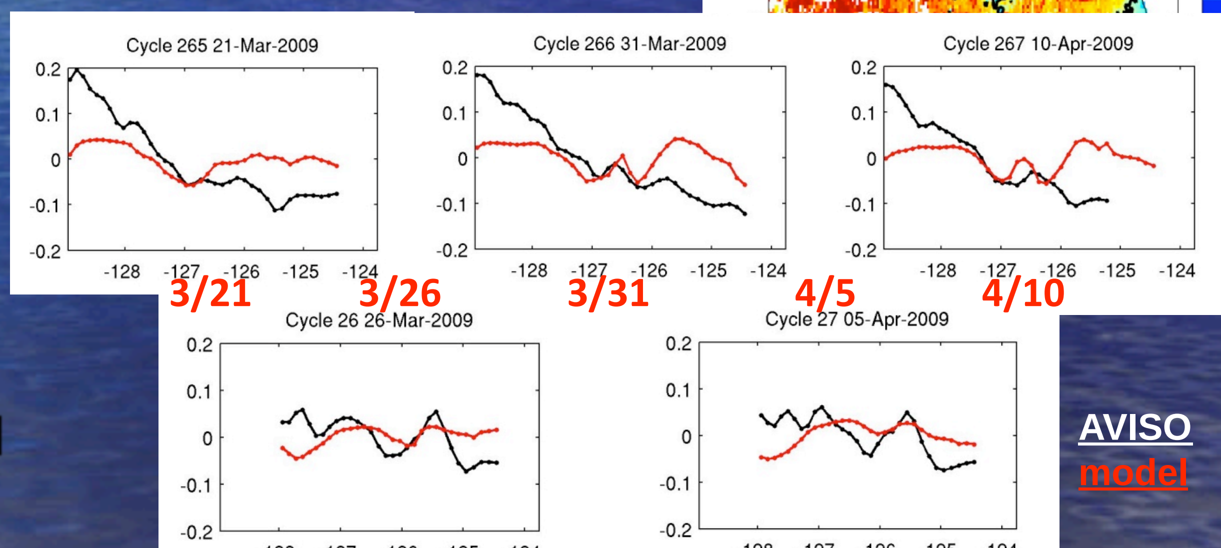
Data along neighboring tracks (J-1 and J-2) show differences in the SSH gradient associated with California Current System meandering.

SST, 3/23/2009



Jason-1: Higher SSH over a warmer area => big gradient along track

Jason-2: smaller gradient over a cold water area



Better sampling of Coastal Current System with Jason-1 & 2

Conclusions

- Many scientific discoveries have relied on high-resolution altimeter data
- A longer high-res altimeter record is needed for ongoing scientific and operational activities
- Maintaining the Jason-1 tandem mission is critical to fulfilling this need